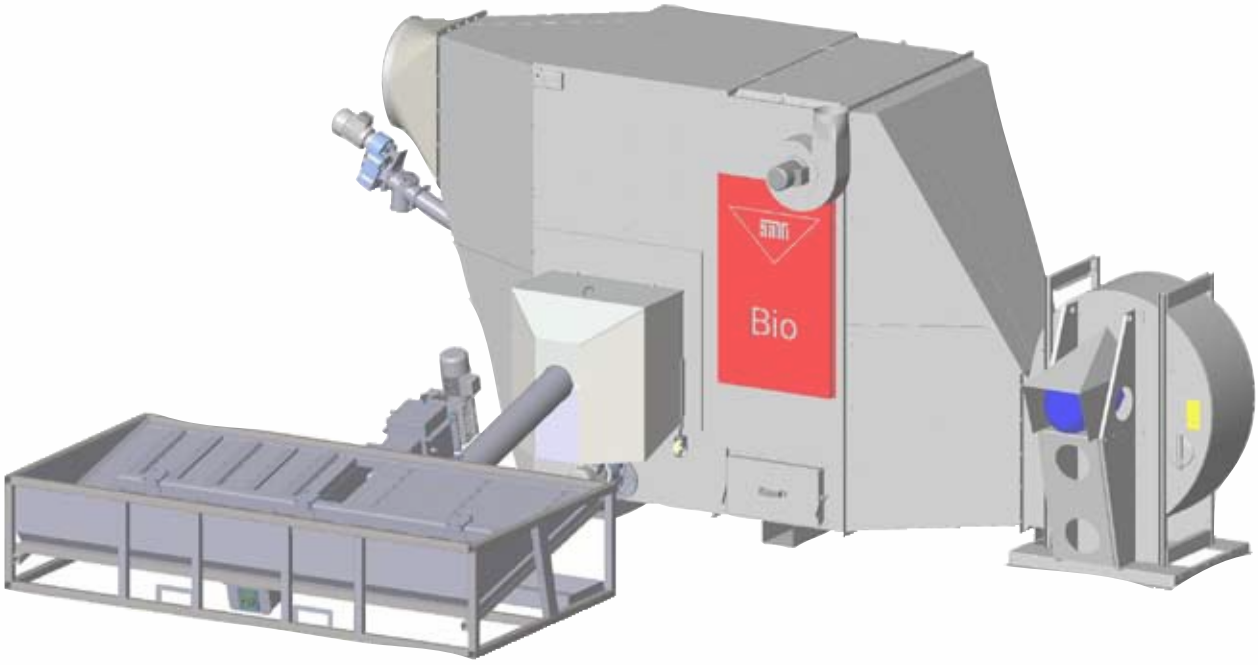
# Installation and Operating Instructions

## AGROSEC VULCAN BIO DRYER HEATER (HIPRESS) 300-500

**408103 (en)**

Agrosec
Grain Handling

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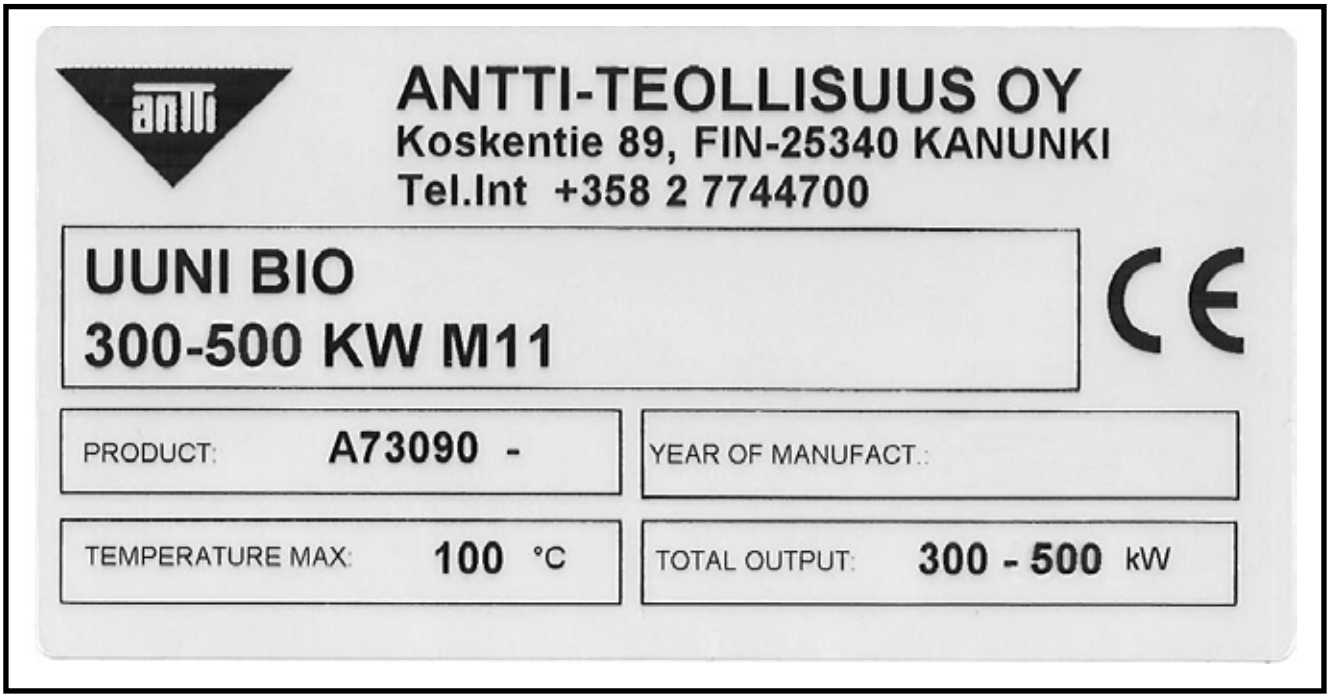
## Dryer heater type

This manual deals with positive pressure dryer bioheaters in ANTTI VULCAN model serie. Refer to the nameplate affixed to the side of the machine for detailed information about the type of your heater. Always notify the seller and the service personnel of the information in the nameplate to ensure quick assistance in case of malfunction and when ordering spare parts. To have this data available whenever required, write it down in the corresponding place on this page.



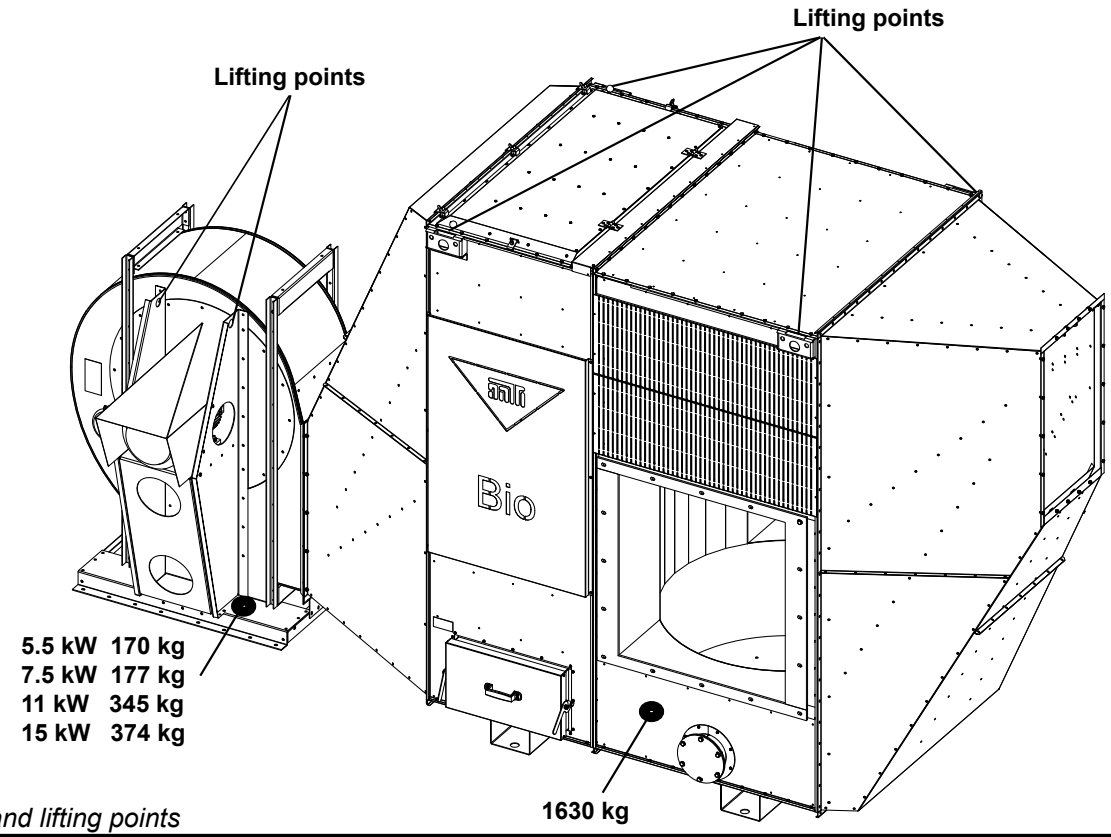

**The maximum temperatures given in the nameplate must be observed, and it must not be exceeded.**

## 1. Lifting the dryer heater into position

- While lifting the heater, observe the following:
    - use all lifting lugs
    - ensure that the lifting gear stays in position in the lugs
    - only use hoists with sufficient lifting capacity
    - never go under or too near the device to be lifted

- Lift the heater without the burner into place as shown in the installation drawing or plan. We recommended that the burner be attached to the heater before the heater is placed into its final location; because the component is heavy, the installation work goes much easier if the space is sufficiently large.

- Because the foundation must be level and steady, there is no need to attach the heater to its bed. Attach the blower firmly in place.




*Weight and lifting points*

## GENERAL INFORMATION ABOUT DRYING OF GRAIN

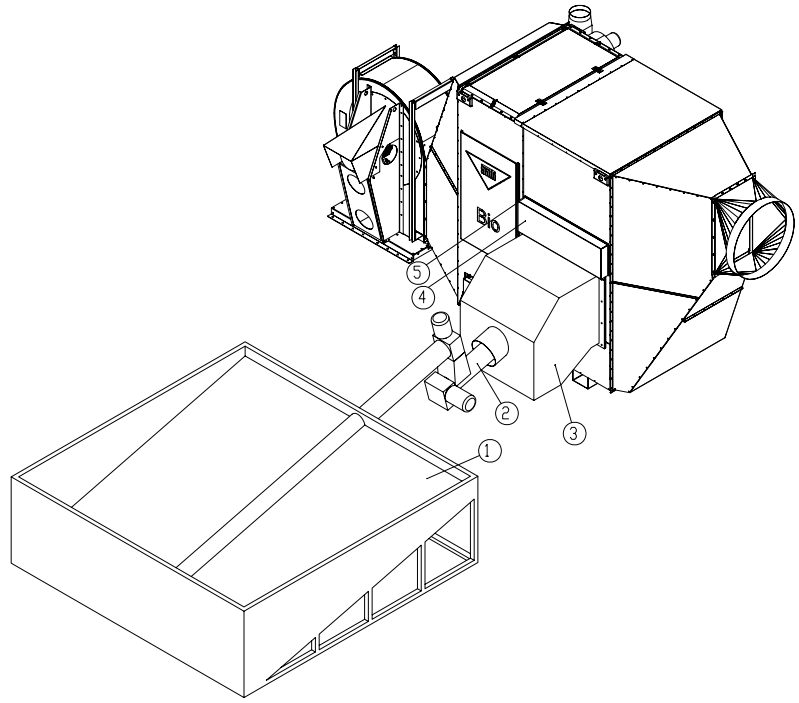
The idea of hot air drying is to conduct warm air through the grain and to evaporate moisture from both the surface and the inside of the corn. The air is routed via pipe or air duct to the drying sections, where the actual drying process takes place. The moist air is led from the drying sections to the outlet air channel, and from there via the pipes to the atmosphere. Applies to positive pressure drying. The maximum temperature of the drying air can be up to 100 C°.

As fuel in the Bioheater can be used almost all energy sources in solid form. the most popular are: wood chips, wood and peat pellets, sod peat, energy grain.

Average consumption of chips at various outputs, dry wood chips:

| Output | Consumption in an hour m³/h | | | |
|---|---|---|---|---|
| kW | 1 h | 2 h | 10 h | 20 h |
| 500 | 0,6 | 1,2 | 6,0 | 12,0 |
| 400 | 0,45 | 0,9 | 4,5 | 9,0 |
| 300 | 0,35 | 0,7 | 3,5 | 7,0 |

In a bioheater, the heater with the heat exchanger comprises a separate set-up. The components for storing and transferring the fuel and the burner are supplied by a third party.
The most common system comprises a bioheater with a blower and a burner to which the feeding screw reclaims fuel from the discharge bottom. In addition, the equipment for transferring ash from the combustion chamber to a larger fire-safe container. The next picture illustrates the basic configuration of the machinery.

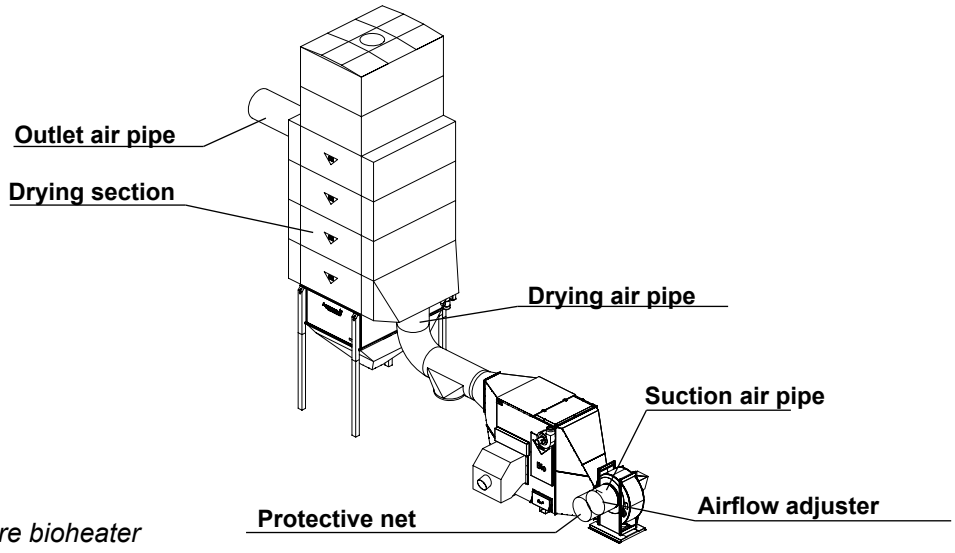



*Bio outfit*

| Part | Item | Denomination | Pcs. |
|---|---|---|---|
| 1 | | RECLAIMER BOTTOM | 1 |
| 2 | | FEEDING SCREW | 1 |
| 3 | | BURNER | 1 |
| 4 | A73316 | BIOHEATER BURNER FLANGE HEAT SHIELD 300-650 KW M11 | 1 |
| 5 | 107720 | SCREW PLATE SELF-TAP HEX 4.8 x13 | 9 |

## POSITIVE PRESSURE DRYING

- The positive pressure heater is intended for warming up the drying air and blowing it under pressure through the dryer.




*Dryer and positive pressure bioheater*

## PURSUED CONFIGURATION

The normal operating environment is an element silo dryer made of steel with a vacuum heater for generation of heat. A grain dryer of section type is placed inside the building and the inlet and outlet air pipes are located on the opposite sides of the dryer building.

The debris pipe from the pre-cleaner must be equipped with a cyclone or equivalent for separation of debris. The separator must be located on the same side with the outlet air pipe or ingress of dust or debris into the suction opening of the heater/blower must be prevented by some other means.

The inlet air is heated by means of a positive pressure heater located in a separate masonry heater room. This heater room can be built either right beside the dryer or near it, but only if the following requirements are met:

- Where wall of the heater room abuts the dryer building, it must meet the requirements of class EI60. Structural details that face outward can be of class EI130, and the roof can be of class EI160.

- Where the heater room wall faces the dryer building from a distance of at least one (1) metre, the wall can be of class EI30. Note! See also the requirements for the flue pipe and the door opening.

- If protected against rain, the heater can be placed at least three (3) metres from the grain dryer and other buildings.

- To ensure sufficient intake of air, the front wall of the heater room must be provided with an opening for replacement air (see table below).. For positive pressure heaters the suction air is usually taken from the side of the heater room via air pipes. The heater room must be located in a dust-free area. Sufficient space must also be provided above the heater so as to make sweeping of the heater possible; the free height above the heater must not be less than 1.2 metres. An even dust-free area must be provided in front of the heater room's air intake; preferably it should be concreted and as wide as the heater room.

- The flue pipe of the heater must be located at least 3 metres from any flammable wall of the dryer building and at least 1.5 metres from any non-flammable wall of the dryer building.

- The heater is provided with a flue gas aspirator, which means that there are no specific requirements for the height of the flue pipe as regards to draught. The sufficient safe distances to flammable materials must, however, be observed.

The above-mentioned distances apply also when an existing dryer is updated to meet the latest requirements. Primarily the same regulations apply to insulated and clad with sheet metal StandAlone dryers installed out of doors as to silo element dryers constructed of steel.

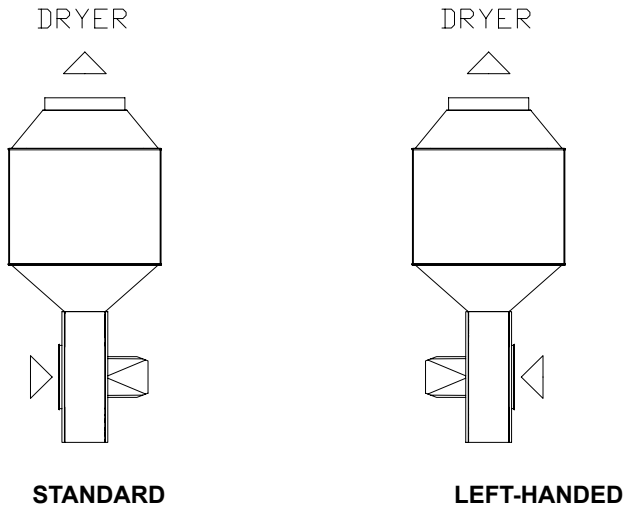
| burner capacity | effective area of the replacement air opening |
|---|---|
| 300 | 1.500 cm² i.e. 39 x 39 cm |
| 400 | 2.000 cm² i.e. 45 x 45 cm |
| 500 | 2.500 cm² i.e. 50 x 50 cm |

## PRESENTATION OF THE MACHINERY

The heater is delivered in several parts; the centre-part of the heater comprises the blower and outlet cones as well as the service door for the burner. The following parts are delivered separately:

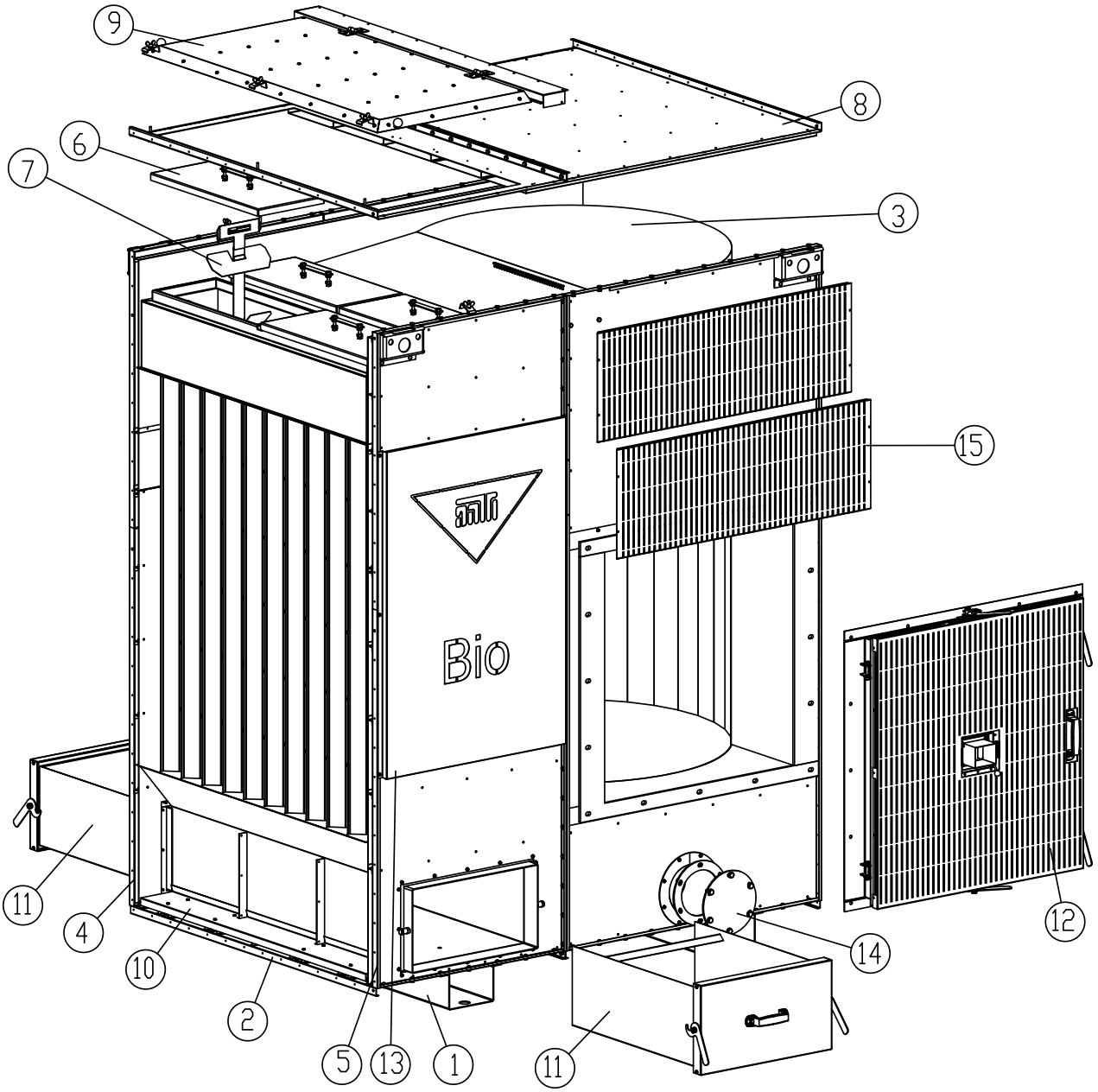
- blower with equipment,
- heat shield for burner flange,
- flue gas aspirator with the accessories required for the installation.
- adapter-plate for the burner depending on the supplier.

In addition the air pipe/pipes must also be fixed. The electric installation in the control centre of the grain dryer must be performed by an electrician. In addition are required the fuel storage and the feeding screws to the burner including the burn back protection.




*The handedness of the blowers in Agrosec Bio Hipress*

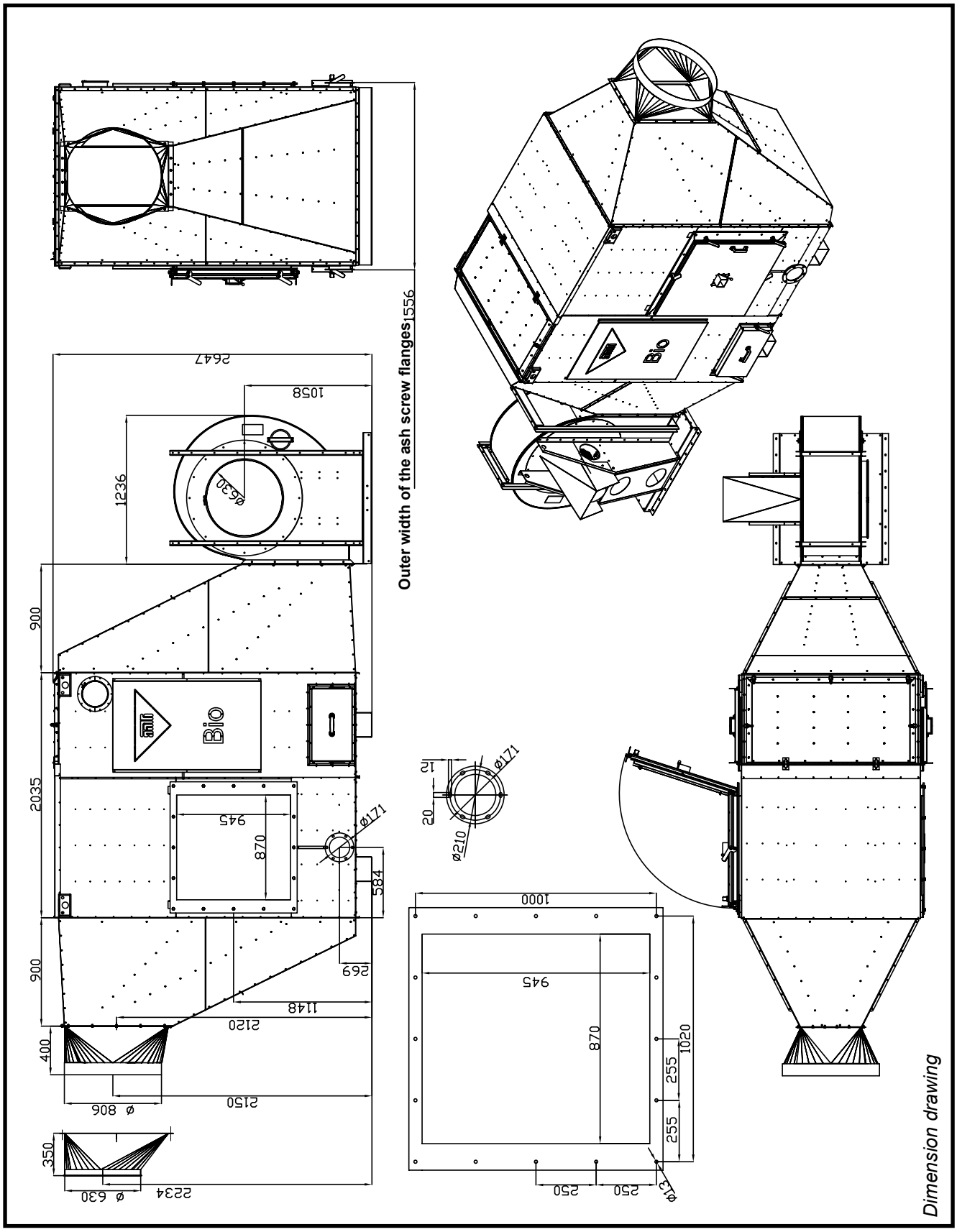
## A73089 SPARE PARTS DRAWING



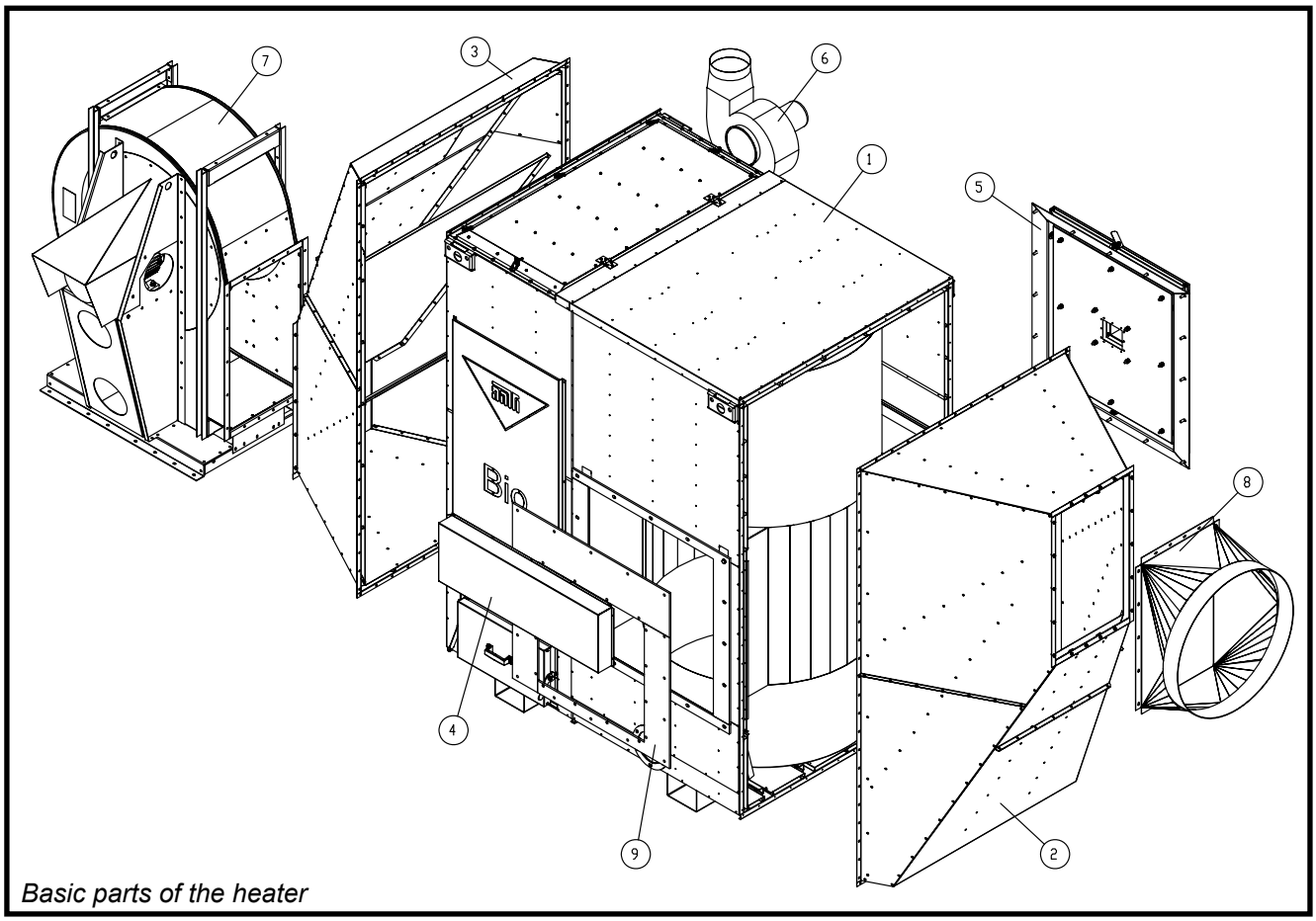

*A73089 Spare parts drawing*

| Part | Item | Denomination | Dwg. no. | Pcs. | Weight |
|---|---|---|---|---|---|
| 1 | A73238 | BIOHEATER JACKET LEG 300-650 KW M11 | A73238 | 2 | 18.5 |
| 2 | A73211 | BIOHEATER BOTTOM PLATE 300-650 KW M11 | A73211 | 1 | 58 |
| 3 | A73091 | BIOHEATER HEAT EXCHANGER WELD 300-650 KW M11 | A73091 | 1 | 682 |
| 4 | A73221 | BIOHEATER LEFT SIDE 300-650 KW M11 | A73221 | 1 | 82.5 |
| 5 | A73230 | BIOHEATER RIGHT SIDE 300-650 KW M11 | A73230 | 1 | 83.9 |
| 6 | A73200 | BIOHEATER HEAT EXCH DOOR 300-650 KW M11 | A73200 | 4 | 18.8 |
| 7 | A73242 | BIOHEATER SMOKE BLOCK 300-650 KW M11 | A73242 | 21 | 2.55 |
| 8 | A73236 | BIOHEATER TOP 300-650 KW M11 | A73236 | 1 | 45 |
| 9 | A73246 | BIOHEATER TOP HATCH 300-650 KW M11 | A73246 | 1 | 24.8 |
| 10 | A73250 | BIOHEATER AIR RESTRICTOR PLATE 300-650 KW M11 | A73250 | 1 | 2.2 |
| 11 | A73196 | BIOHEATER ASH BOX ASSY 300-650 KW M11 | A73196 | 2 | 21.9 |
| 12 | A73184 | BIOHEATER ASH BOX ASSY 300-650 KW M11 | A73184 | 1 | 70 |
| 13 | A73317 | BIOHEATER PRODUCT PLATE 300-650 KW M11 | A73317 | 2 | 8.6 |
| 14 | A73433 | BIOHEATER ASH COVER PLATE 300-650 KW M11 | A73433 | 2 | 2.1 |
| 15 | A73832 | BIOHEATER SHROUD M11 | A73832 | 4 | 4.1 |
| 16 | 115550 | GLASS FIBRE BAND 6X15 MM | | 12 | |
| 17 | 115579 | CERAMIC BAND KERABAND 3x9 | | 46 | |

## Dimension drawing



## Basic parts of the heater




*Basic parts of the heater*

| Part | Item | Denomination | | Dwg. no. | Pcs. | Weight (kg) |
|---|---|---|---|---|---|---|
| 1 | A73089 | BIOHEATER centre-part 300-650 KW M11 | | A73089 | 1 | 1290 |
| 2 | A73281 | BIOHEATER outlet cone 300-650 KW M11 | | A73281 | 1 | 131 |
| 3 | A73280 | BIOHEATER blower cone | | A73280 | 1 | 163 |
| 4 | A73316 | BIOHEATER burner flange heat shield 300-650 KW M11 | | A73316 | 1 | 5.9 |
| 5 | A73184 | BIOHEATER burner door assy 300-650 KW M11 | | A73184 | 1 | 70 |
| 6 | 114590 | Flue gas aspirator 1.1 KW D200/200 500063 | | | 1 | 25 |
| 7 | 22436 | Heater blower 11 kW standard | optional | 22436 | 1 | 345 |
| 7 | 22439 | Heater blower 11 kW left | optional | 22439 | 1 | 345 |
| 7 | 22472 | Heater blower 15 kW standard | optional | 22472 | 1 | 374 |
| 7 | 22473 | Heater blower 15 kW left | optional | 22473 | 1 | 374 |
| 8 | 22430 | Adapter blower pipe D630 | optional | 22430 | 1 | 10.6 |
| 8 | 22474 | Adapter blower pipe D800 | optional | 22474 | 1 | 13.4 |
| 9 | | Adapter flange in accordance with the dimensions of the burner | | | 1 | |

## INSTALLATION

Installation of the dryer heater must be carried out by a skilled electrician and oil burner fitter with relevant authorisation as well by a person who is familiar with the installation of the dryer machinery and the fuel systems.

**NOTE! DEBRIS IN THE SUCTION AIR OF THE HEATER CONSTITUTES A FIRE HAZARD!**

**THE HEATER MUST BE LOCATED SO THAT DEBRIS IS PREVENTED FROM ENTERING IT.**

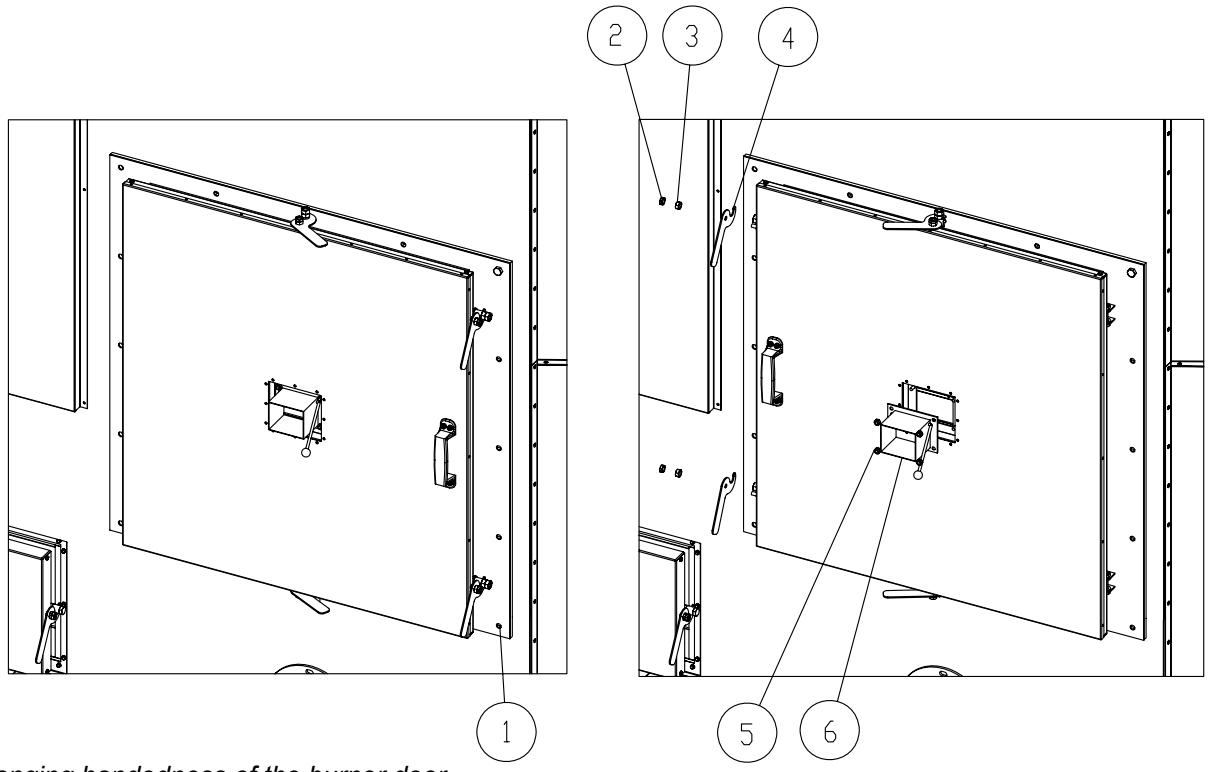
## Changing handedness of the burner's service door

The burner's service door can be transferred to the opposite side of the heater, or its handedness can be changed as desired.
When removing the door, bear in mind that it is heavy, weighing about 97 kg.

If you only want to change the handedness of the door, remove the hinges (2 pcs. of M12 nuts) from the frame of the door, which remains in place against the burner flange. Remove the counter-pieces for the latch from the sides and attach the door by its hinges to these holes. After that, you only have to turn the control door and the latches (2 pcs.) on the side and attach the counter rollers for the latches. Fitting the door against the frame shall be commenced from the side of the hinges. The door must fit tightly, but it must not press the gasket too much at the side of the hinges. After this, the counter rollers for the latches shall be adjusted to a suitable distance. Check that the gasket is in contact with the door frame, when the latches are closed.

When you use the door while the flue gas aspirator is running, bear in mind that there is vacuum inside the burner chamber. The large surface area affects the opening of the door. The vacuum "sucks" the door, so be careful not to put your fingers between the door and its frame.

**WARNING! When the heater is in operation, the door must not be opened -> risk of burns/danger to life.**




*Changing handedness of the burner door*

| Part | Item | Denomination | Dwg. no. | Pcs. | Weight |
|---|---|---|---|---|---|
| 1 | A73184 | BIOHEATER BURNER DOOR ASSY 300-650 KW M11 | A73184 | 1 | 100 |
| 2 | 110588 | NUT M10 LOW DIN936 | | 2 | |
| 3 | 110560 | NUT M10 DIN934 | | 2 | |
| 4 | A73188 | BIOHEATER LATCH | | 2 | |
| 5 | 110616 | NUT AISI 304 M8 DIN934 | | 4 | |
| 6 | 800027 | FLAME CONTROL DOOR | | 1 | 0.5 |

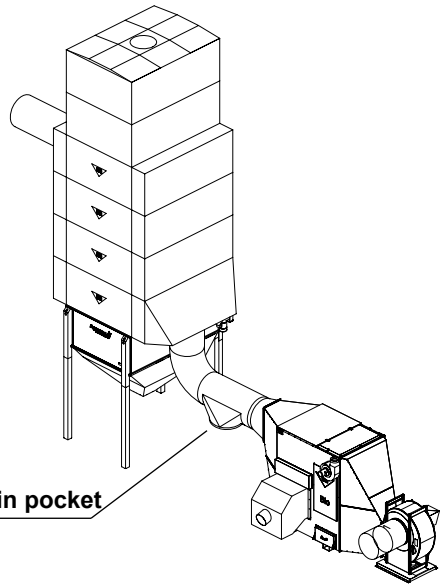
## 2. Installing the air and flue pipes

- The air piping between the dryer heater and the dryer is assembled of air piping parts.
- Normally the inlet air pipe from the heater is conducted into the lowest drying sections.
- The air piping shall be installed so that neither loose grain nor debris can slide directly into the heater from the air channel end of the drying section.
- Before installing the pipes and the blower, make sure that no foreign particles have entered the heater.

**WARNING! Foreign particles inside the heater are a fire hazard!**

### Grain pocket in the air pipe

Occassionally, some loose grains can fly out of the openings in the air ducts to the air channel end. If the dryer heater is connected to the heater as illustrated in the picture, the air pipe must absolutely be provided with a grain pocket. The purpose of the grain pocket is to gather up the loose grains, and prevent them from ending up in the heater. The grain pocket must always be emptied before it fills up.




*Install the grain pocket in the horizontal part of the air pipe to ensure its operation is efficient, see the picture.*

Carry out the installation as follows; lift the part tight against the pipe and tighten it to the pipe using straps. Draw a pattern for cutting through the opening; remove the part and make the opening using a nibbler or plate shears. Lift the part back in place and tighten its against the pipe using straps. Fix the part to the pipe using self-tapping screws and pop-rivets. Finish the work by applying sealing mastic. Provide the outlet sleeve for the pipe at the grain pocket with a plug and, as necessary, ensure that it stays in position using self-tapping screws.

- The delivery of the dryer heater comprises a flue gas aspirator, a set of flue pipes, and a rain cap for the flue pipe. The flue gas aspirator shall be installed as close to the heater as possible, so it does not have to be supported separately. Ensure, however, that the other parts of the flue pipe system are properly supported, so that the aspirator connector, the flue pipe flange or the aspirator will not be subjected to excessive load. The parts included in the delivery are sufficient for most vertical pipe installations.

- The ceramic seal strip, which is included in the delivery, comes between the flanges of the heater's flue pipe. The strip is squeezed between the flanges under the band.

- Often the flue pipe is led horizontally through the heater room wall and the parts of the vertical pipe are installed in a vertical position outside the heater room. In this case, a straight pipe is required between them.
  Because the installation practice varies from case to case based on the design of the heater room and the way the fire regulations are locally applied, it is advisable to submit the installation plan in advance to the municipal fire authorities for approval.

- The flue pipe parts made of thick material are quite heavy. Make sure the pipe is sufficiently supported. No load shall be subjected to the flue gas aspirator. A separate supporting structure is required under a pipe longer than this and its elbow. A vertical pipe, over 3,0 metres in length, must be supported also laterally either using stay wires or support bars.

## 3. Installing the burner and the equipment for fuel storage

To the mechanic and electric installations of the burner equipment apply the instructions issued by the supplier of the burner.The electric installation shall be carried out by a skilled electrician with relevant authorisation.

**The maximum temperatures given in the nameplate must be observed, and they must not be exceeded.**

- The installation rails, along which the heater can be pushed into the heater, are included in the heater delivery. The rails shall be placed between the openings in the heater and removed after the installation.

## 4. Electric installation

Assign an authorised electrician to all electrical installation work, installation of thermostats and connections to the control centre of the dryer!
The electrician shall issue a certificate of the installation in writing.

The sensors of the burner shall be installed in accordance with the burner supplier's instructions.

Instructions for the electrician on installation of the thermostats and sensors (see also Fig. "Location of the thermostats in the dryer"):

- On the inlet side, the thermostats and the sensor are installed in the air pipe inside the building (if there is a building) in a straight part of the pipe (not near curves) where the airflow is smooth. Furthermore, the sensors must not have a direct "line of sight" to the rear part of the combustion chamber so as to prevent the red glow im the combustion chamber from affecting the values measured by the thermostats.

  If the sensors transmit the wrong information, shifting one of them to the other side of the pipe may help. Hot and cool air have probably not yet been mixed completely at this stage. Another option is to measure the true temperature of the drying air and to raise the setting of the thermostats from their rated values by the difference between the true and the wrong measurement results (applies to the LTM thermostat).

- On the outlet side, the thermostats and the sensors shall be installed in the outlet air pipe.

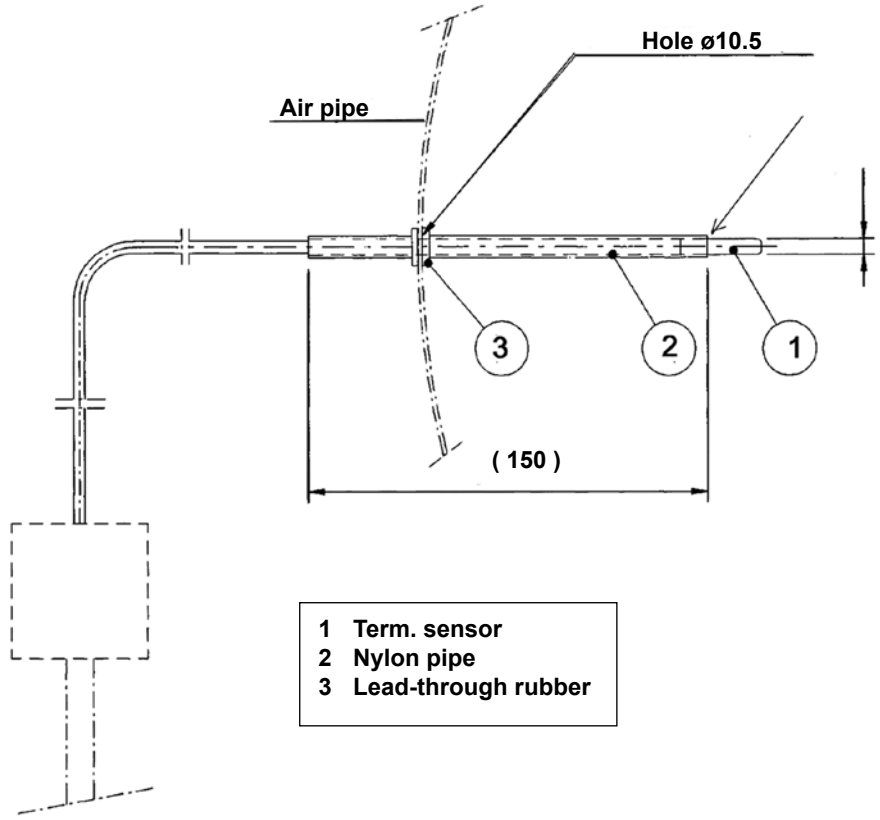
- The electric conductors must be at a distance of at least 50 mm from the surface of the heating pipe so as to avoid the risk of overheating.

- Carry out the electric connection of the heater in accordance with the wiring diagrams for the electric centre.

**Thermostats and their initial settings:**

- Temperature regulator LTM -thermostat. If a Logic Control Centre is being used, there is no need for a separate LTM thermostat. If the maximum drying temperature of 100 °C is applied, the "limit" value for the thermostat must be raised to 130 °C, so that the burner will be switched off if this temperature for any reason will be attained (malfunction). The standard setting is 110 °C and it is intended for standard positive pressure heaters. The thermostat in question also prevents the blowers from stopping until the drying air temperature has dropped to 45 °C, i.e. to the "fan" value of the thermostat. There are two discs inside the thermostat for adjusting the "fan" and "limit" settings. The sticker under the openable cover indicates that the terminal blocks in the system 1 are multiplexer, etc. Drill a D19 mm hole in the air inlet pipe for the capillary pipe of the thermostat to be inserted into the air pipe and fix it by its holder on the pipe, for example, using self-tapping screws.

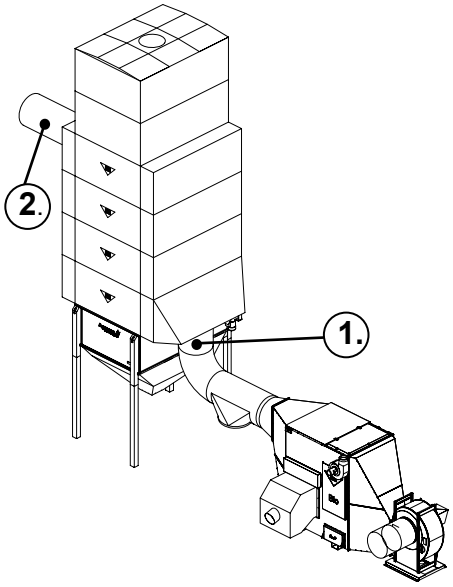
- The sensor for the drying temperature is included in the Bioheater delivery. Connect the sensor to the control centre of the burner – not to the control centre of the dryer. The sensor shall be inserted about 100 mm into the air pipe, see the picture below. The control centre of the dryer may be equipped with a thermostat for the drying air temperature, but in the case of bioheater, it will remain unused. The sensor can naturally be installed in the pipe, and used for monitoring prevailing temperature on the thermostat's display, but otherwise it is useless. The desired drying temperature is adjusted in the control centre of the Bioheater.




*Installation drawing for the outlet temperature sensor*

- The purpose of the outlet air thermostat is to switch off the drying procedure as the outlet air temperature reaches the desired value. The sensor shall be installed in the lower outlet air pipe. The cut-off temperature is normally about 35-50°C; it depends on the cereal being dried and the drying temperature applied. If drying temperatures higher than normal are applied, the cut-off temperature will also be higher. Install the sensor in the pipe in the same way as the drying air sensor that was described earlier in this manual (see the picture).

- The fire thermostat shuts down all the operations of the dryer immediately after the pre-set temperature has been reached, for example, as a result of fire inside the dryer. The fire thermostat is delivered with the blower. The fire thermostat shall be installed in the outlet pipe. Normally the thermostat is adjusted to 60 °C. The thermostat comes with a 2-metre-long capillary pipe, which makes it possible to install the thermostat box in a location where it is easy to access. The manually operated reset button at the side of the thermostat box must always be reset after the temperature has risen to the switch-off limit. In normal operation the temperature never rises to such a high level. Such an exceptional situation may occur while the dryer is being test run empty whereupon the temperature may easily rise to the pre-set switch-off value.




*Location of the thermostats in the grain dryer including the sensors, delivered by the burner supplier*

1.

- Drying temperature sensor PTC (for the 2nd flame in the heaters fuelled by oil; in a bioheater only for monitoring the temperature)
- LTM thermostat (not to be installed if the dryer is equipped with Logicontrol)
- Air temperature sensor delivered by the burner supplier
- Sensor for constant temperature (optional)

On the inlet side the sensors are installed in the air pipe inside the building in a straight pipe part (not near curves). The sensors must not be in direct line of sight of the rear part of the combustion chamber. The heat radiation from the chamber transmits wrong measurement result to the thermostats.

2.

- Outlet air thermostat PTC
- Fire thermostat

To be observed before start-up

- The oil burner fitter and the electrician have completed the test run.
- The operation of the safety devices needs to be tested in practice to ensure their proper operation.
- That the amount of fuel in the fuel storage is sufficient.
- There are no objects in the heater room that do not belong there.
- That exclusively clean air is blown through the heater.
- Check once more that the main switches and possible safety switches are in the operating position.
- That there is a fire extinguisher outside the heater room during drying.
- That the slab in the front and at both sides of the suction nets is clean and, for example, the wind cannot blow debris or withered plants near to the suction cone opening of the heater.

# OPERATING INSTRUCTIONS FOR THE DRYER HEATER

## Adjusting the output

- If necessary, restrict the flow of drying air using the adjuster in the suction air piping for the drying air blower.

- You can only monitor the temperature of the drying air with the digital gauge in the electric centre of the dryer. In the heaters fuelled by oil, this gauge is used as a digital thermostat for the 2nd stage.

- The target value of the drying temperature is set in the electric centre of the burner.

- Carry out the adjustment of the burning air in accordance with the instructions in the manual, using a flue gas analyser. Make sure, however, that the maximum temperature marked on the heater's nameplate is not exceeded. It is also recommended not to operate the heater at too low an output, because if the temperature of the flue gases drops too low, water starts to condense.

- When moving from the drying stage to the cooling stage after the drying, the thermostat of the drying automation stops the burner automatically or switches it to maintenance mode (depending on the burner supplier) as soon as the pre-set outlet temperature, i.e. the cut-off point, has been reached (if the heater is connected to an automatic centre). NOTE! Depending on the fuel, the time required for shutting down will be quite long (on energy grain). Keep an eye on the lower outlet temperature.

- The heater fan cannot be switched off even from its operating switch before the heater has cooled down below the "fan" temperature of the LTM thermostat (nor shall the heater blower be switched off from the mains switch until the heater has cooled down).

  Familiarise yourself with the instructions issued by the burner manufacturer before use!

- Check the amount of ash in the furnace regularly, and empty it as required.

# SERVICING

## Annual service

- The flue pipe of the heater must be swept yearly immediately after the drying season. The heat exchanger must be swept frequently to prevent reduction of the heater output. If the temperature of the flue gas has risen notably over its normal value, it is time to sweep. The hinged hatch at the top shall be opened, and after that the heat exchanger doors (4 pieces) shall be lifted away. The smoke blocks shall be removed from the convection channels of the heat exchangers, and after that, the convection channels shall be cleaned using a tube brush. A "rapid" sweeping can be carried out by swinging the smoke blocks up and down a few times.

- Before you close the cleaning doors, check that the fire wool in the door is intact and in every respect in order. If air leakage is possible, renew the wool. The seals on the hinged door must be checked, and renewed if found defective.

- The burner shall be serviced in connection with the sweeping. Check the measures required by the instructions issued by the burner manufacturer.

- Check before the start of the drying season using a flashlight that there are no mouse, rat or bird nests, which might constitute a fire hazard, between the surfaces of the heat exchanger inside the heater.

- Ensure that the inlet air piping to the dryer is clean. Some runoff of grain from the dryer may have occurred in connection with filling.

- Remove the ash from the furnace and the ash box after the drying season.

## Service during the operation

- If all annual services have been performed with care, the dryer heater only requires daily visual checking during the operating season. Even when the operation of the heater is controlled from the electric centre of the dryer/ burner, it is advisable to go and look at and listen to the heater a few times a day to ensure its normal operation.

- It is advisable to always look at the upper end of the flue pipe when passing by: the exhaust gases should be colourless and invisible. When a cold heater is started, visible water vapour may come out with the flue gases. Dark, visible smoke indicates incomplete burning of the fuel. In this case the flowrate of the burning air must be checked immediately to prevent the heat exchanger from getting sooted.

- The net in front of the suction opening must be clean. Observe the fire risk. If you have to clean the net on a regular basis, you have to do something about the surroundings as well; otherwise, the risk of fire will be too high.

- The amount of ash in the furnace under the burner must be checked daily; in particular, if the fuel that you have been using is grain, because grain leaves behind plenty of ash.

**WARNING!** **If the surface of the ash rises to the level of the burner, the burner may be damaged because of the impaired cooling.**

- If the settings of the burner are correct, the amount of ash gathering in the ash box is not great. The amount of ash in the boxes must be checked regularly, and if necessary, the boxes must be emptied. If the surface of the ash in the box rises too high, the flow of the flue gas will be restricted. In the worst case, the flue gas does not flow properly, and then the settings of the burner will change, and the combustion will be incomplete.

**WARNINGS!**

- Do not go into the fuel storage, if it has no ventilation. A closed space can be devoid of oxygen, and thus dangerous to life. Do not work alone in the fuel storage.
- BEWARE OF THE BURNER'S HOT SURFACES! The burner is insulated, but certain of its steel parts can be hot as they are in contact with the jacket of the burner.
- THE SAFETY SWITCH MUST BE LOCKED IN THE OPEN-POSITION FOR SERVICING!
- THE SYSTEM MUST NOT BE BROUGHT INTO OPERATION BEFORE ITS INSTALLATION HAS BEEN COMPLETED, ITS SAFETY DEVICES HAVE BEEN TESTED AND ESTABLISHED TO BE FUNCTIONING PROPERLY, AND THE OPERATOR HAS FAMILIARISED HIMSELF WITH THE CORRECT USE OF THE SYSTEM AND UNDERSTANDS HOW IT WORKS.
- NEVER PUT YOUR HANDS THROUGH THE OPENING INTO THE FREE FALL FUNNEL

## GUARANTEE

The guarantee period for the Antti-heaters is one (1) operating season. A five-year guarantee is granted to the fire surfaces of the heater. The guarantee covers defects in material and workmanship. For the electric motors, the separate guarantee terms, issued by the respective manufacturers and importers, apply.
The guarantee matters on the burner and the rest of the bioheater set-up shall be agreed upon with the manufacturer/supplier.

A prerequisite for validity of the guarantee is that the instructions issued by the manufacturer and the valid regulations have been followed during installation, use and service of the dryer heater.

All matters related to the guarantee shall be agreed upon with the manufacturer before any action is taken.

## EU Declaration of Conformity

**ANTTI-TEOLLISUUS OY**
**Koskentie 89**
**FI-25340 KANUNKI**
**Tel. +358 2 7744700**
**Fax +358 2 7744777**

**declares that**

## AGROSEC VULCAN BIOHEATER

**conform with the provisions of the following directives:**

- **Machine Directive 2006/42/EC**
- **Low Voltage Directive 2006/95/EU**
- **Electro-Magnetic Compatibility Directive (EMC) 2004/108/EU**

**Kuusjoki 11.05.2010**

**Kalle Isotalo**
**Managing Director**

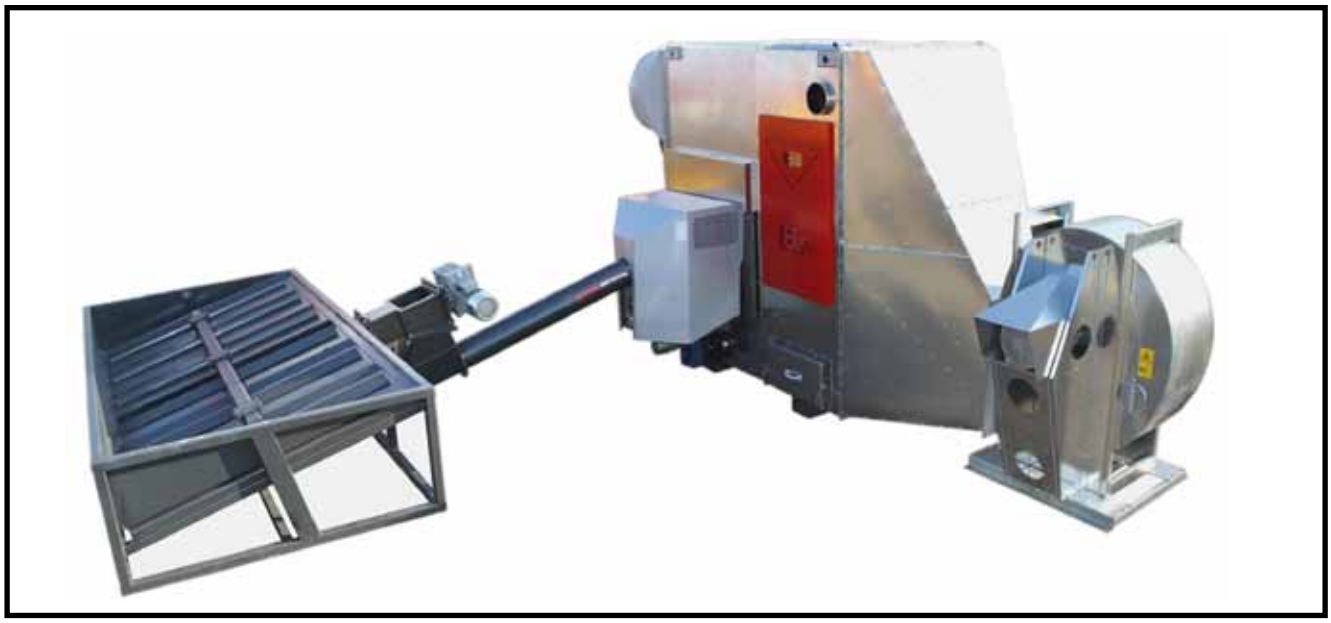
# User manual for ANTTI Agrosec Bioheater and Ariterm Multijet bioburner ->

# User manual for Antti Agrosec Bioheater and Ariterm Multijet bioburner

This manual outlines the Antti Agrosec Bioheater and the Ariterm Multijet Bioburner.
The manual covers only the installation and key parameters of the Ariterm Multijet Bioburner. If a bioburner from any other manufacturer is installed in the Agrosec Bioheater, the information presented in this manual is not necessarily accurate.

The construction of the Agrosec dryer heater is upright, which means its furnace and tubes are in an upright position. The heater is designed only for the large flame created by biofuel. The efficiency of the heat exchanger is excellent and the materials of the heater can withstand continuous operation. The ash created from biofuel is gathered in the lower part, and can be automatically removed using the ash screw.

Ariterm MultiJet Bioburner has been designed for many different biofuels. Suitable fuels for the burner are, for example, various chips, wood and peat pellets, sod peat, and various fuels from the field.



## Location of the equipment

Lift the dryer heater into place as shown in the installation drawing or the installation plan. Bear in mind that you have to provide space between the heater and the heater room wall for both the burner and the burner screw. Take into account in planning that you probably have to be able to demount the burner and the burner screw/motor for maintenance (e.g. doorways). It is recommended that a space of at least one metre be reserved between the heater and the wall on those sides, where sweeping and maintenance work will be carried out. We recommend that you attach the burner to the heater before placing the heater in its final location; this is because the component is heavy, and the installation work is much easier if the space is sufficiently spacious.

Because the foundation must be level and steady, there is no need to attach the heater to its bed. Attach the blower firmly in place.

## Presentation of the equipment

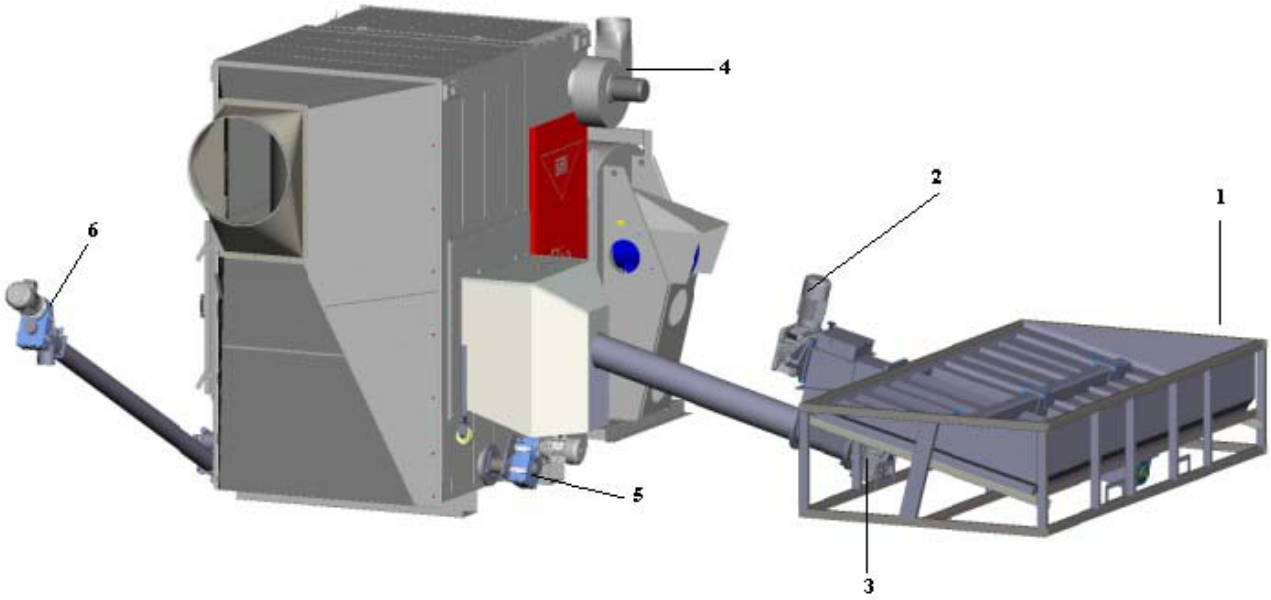



Fig. 1. Presentation of the equipment

1. Discharge bottom
2. Storage screw/Storage screw motor
3. Feeding screw/Feeding screw motor
4. Flue gas aspirator
5. Ash screw in the furnace under the burner (primary screw)
6. Ash screw out of the heater room (secondary screw)

## Presentation of the blower motors, grate motors and sensors

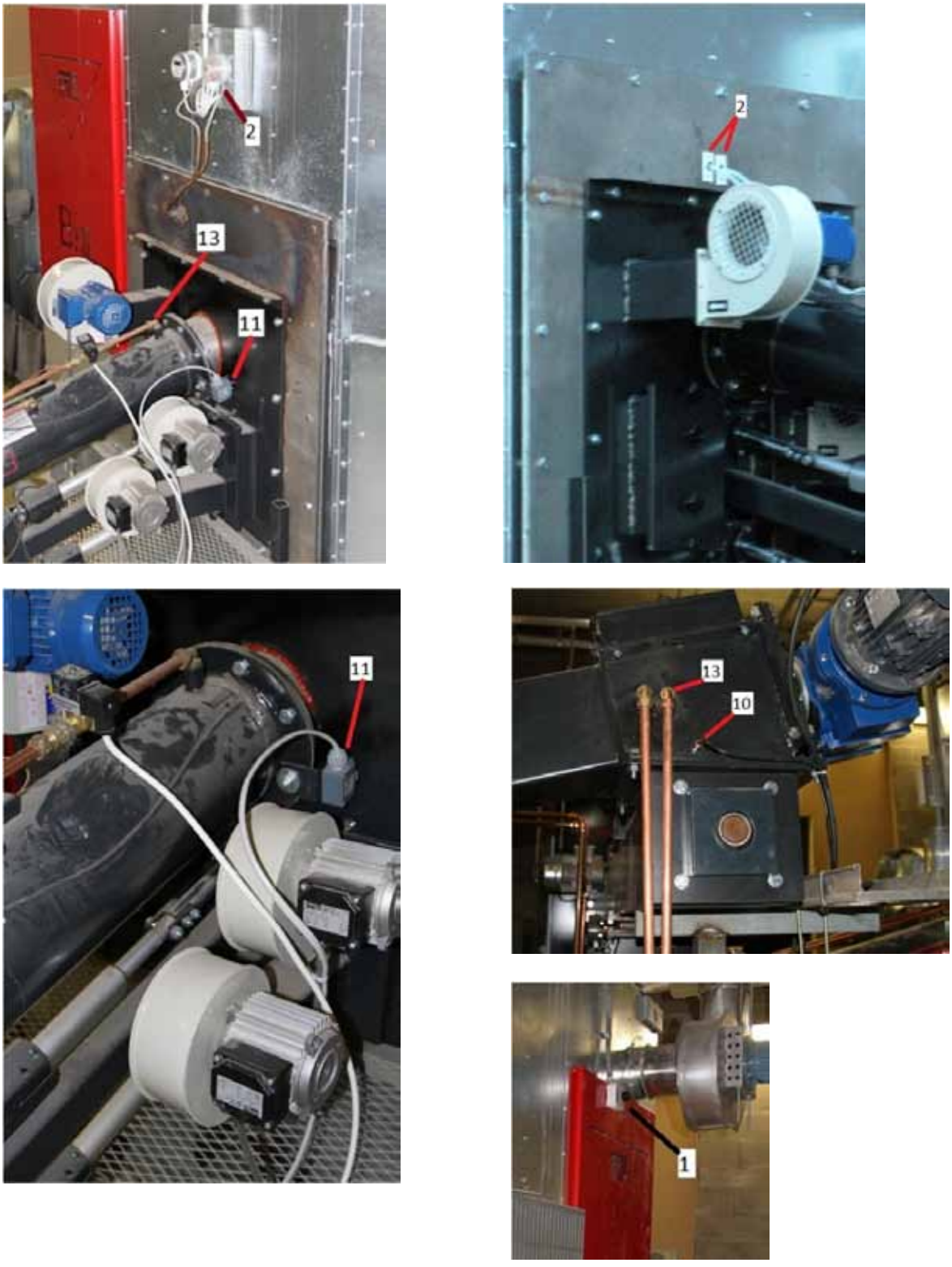



Fig. 2. Presentation of the blower motors, grate motors and sensors

1 Drill a hole in the flue pipe and install the sensor for the flame control thermostat in it, and adjust it to 100 ºC.

2 The adapter flange comes with holes for the vacuum sensors. Provide the holes with copper pipes, and connect the hoses that come from the sensors to these pipes.

3 Secondary blower

4 Primary blower 2

5 Primary blower 1

6 Grate motor 1

7 Grate motor 2

8 Install the burn back protection in the small pocket, and adjust it to 60-70ºC.

9 Limit switch for the top of the free fall funnel

10 Installation hole for the photo cell pair (installed face-to-face)

11 Install the dislocation limit switch between the burner and the burner screw. When the dislocation limit switch operates, it shuts down the system with the exception of the flue gas aspirator.

12 The drying temperature sensor (not shown in the picture) is installed in the air pipe of the dryer at a distance of about three metres from the bioheater.

13 Back burn protections

**NOTE the correct installation position of the feeding and storage screws in the picture 2 (Horizontal ! )**

# BACK BURN PROTECTION

The system must be provided with back burn protection. Usually, water is not available in the vicinity of the dryer and the heater room is not insulated. Therefore, we apply dry back burn protection and a powder extinguishing system. If the temperature in the burner screw rises too high, the powder extinguishing system is activated, and empties its cylinder into the burner screw and the free fall funnel.

## Connections of the back burn protection (back burn protection with water)

Controlled by the temperature sensor, the pulse-controlled extinguishing system squirts a dose of water into the feeding pipe in pursuit of increasing the moisture of the fuel and decreasing the temperature thus eliminating the preconditions of the fire to spread. The system neither shuts down the equipment nor raise an alarm. Controlled by the temperature sensor, the automation rotates the screw for a pre-set period of time in pursuit of driving the hotbed off the screw . The automation shuts down the system and raises the alarm. Controlled by the temperature sensor, the AVTA valve squirts water into the feeding system and puts out the fire.

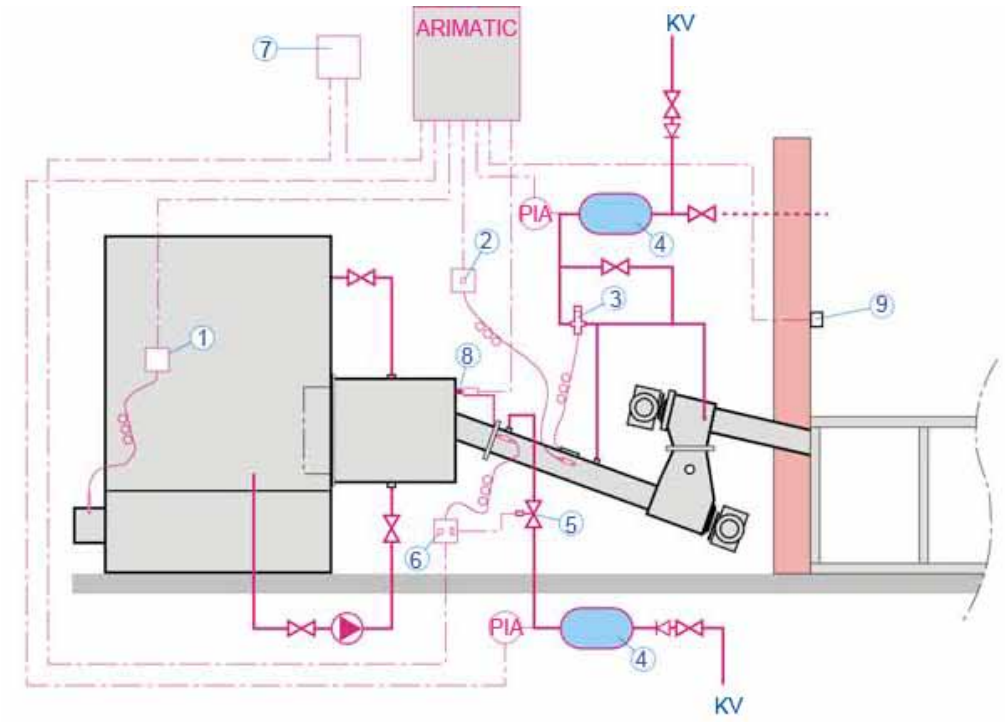



Fig. 3. Connections of the back burn protection (chip system)

1 Flame control thermostat (Note! To be installed acoording to Fig. 2)
2 Back burn thermostat (To be installed in the small pocket, see Fig. 2)
3 AVTA valve, self-initiated DN 25
4 Expansion tank 35-50 litres, press. 100 kPa
5 Solenoid valve, 230 V
6 Pulse-controlled back burn protection
7 UPS device
8 Dislocation limit
9 Alarming temperature sensor in the silo PIA, alarm pressure gauge 0-600 kPa
⋈ Shut-off valve
⋈ Check valve

## Connections of the back burn protection (dry back burn protection with powder)

The powder extinguishing system operates in the same manner as the pulse-controlled extinguishing system, but uses powder instead of water.

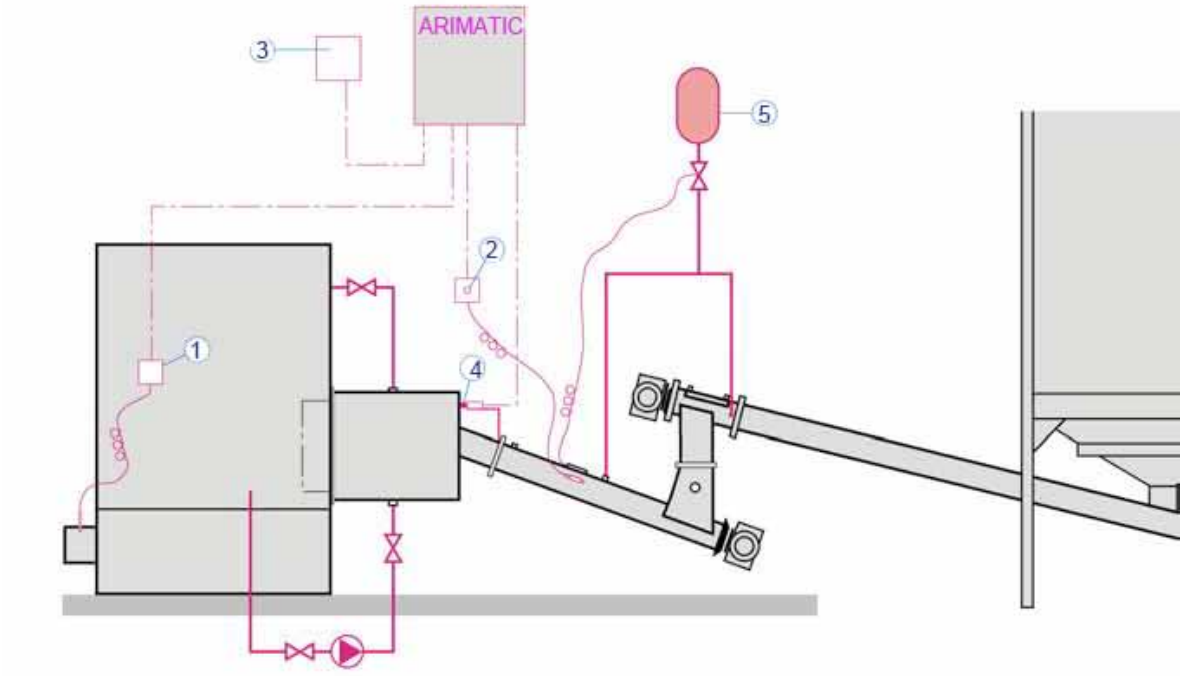



Fig. 4. Connections of the back burn protection (Pellet and chip system)

1 Flame control thermostat (Note! To be installed according to Fig. 2)
2 Back burn thermostat (To be installed in the small pocket, see Fig. 2)
3 UPS device
4 Dislocation limit
5 Powder extinguishing system with two hoses
⋈ Shut-off valve

## Putting into operation/testing

Test the operation of the system before putting the unit into operation as follows:
Start the motors (of screws and blowers) one at a time, and check the following:

- Direction of rotation of the screws
- Operation and direction of rotation of the flue gas aspirator
- Reverse function of the fuel screws
- Operation of the pumps
- Operation of the moving grate

Check the safety equipment (back burn protection with water)

- Adjust the tripping temperature of the back burn thermostat so low that it will give an alarm.
- Turn the thermostat for the AVTA valve so that it will trip, and check that the nozzles are open. Note that the amount of water can be large. Therefore, we recommend directing the water nto a separate vessel.
- Adjust the operating temperature of the pulse-controlled back burn protection so low, that it will trip.

As required, warm up the sensors carefully:

- Check the overheat protection, dry-boil protection and the other connected safety equipment
- Check the alarm functions, and if the remote notification feature is active, a notification will be sent.

Familiarise yourself carefully

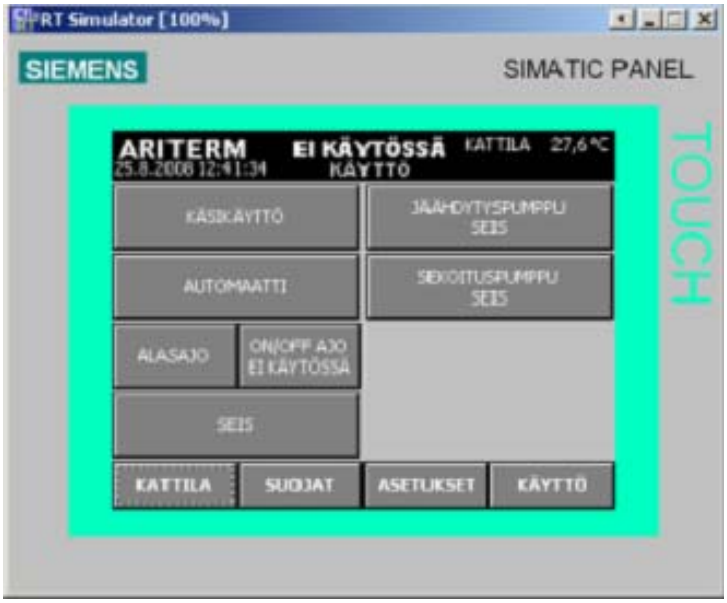
**Familiarise yourself carefully with the user manual for the control automation of the burner before you start the system.**

## Starting up the burner

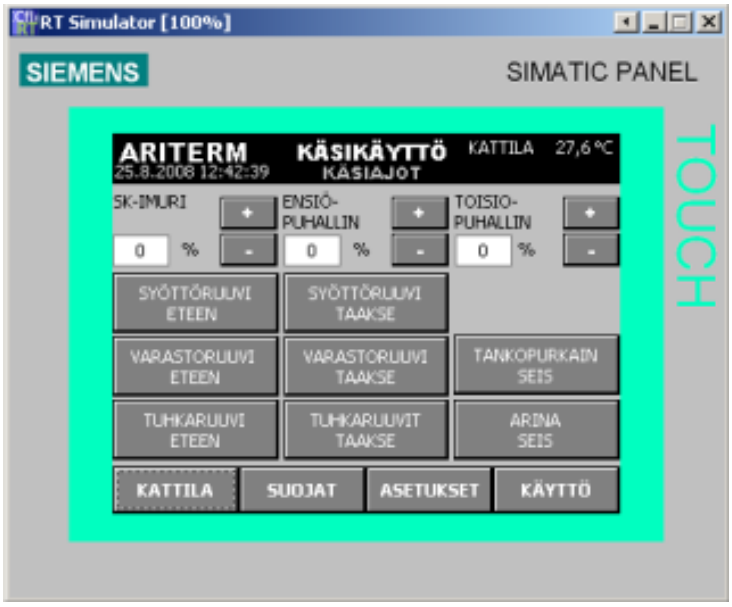
These instructions describe the start-up procedure of the Multijet burner. When the text refers to some menu item or adjustable parameter, the text is written in italics in quotes; for example, "FEEDING SCREW FORWARD".

**NOTE! The drying must be switched on from the control centre of the dryer before the lighting up of the burner is started.**

1. The burner is lit by selecting "MANUAL OPERATION" in the logic centre's display.




2. Start by setting the function "STORAGE SCREW FORWARD" to the "STORAGE SCREW RUNNING FORWARD " mode.
Now the storage screw has been switched on.



3. Next the function " STORAGE SCREW FORWARD" shall be set to the mode "STORAGE SCREW RUNNING FORWARD", and kept active in this position.

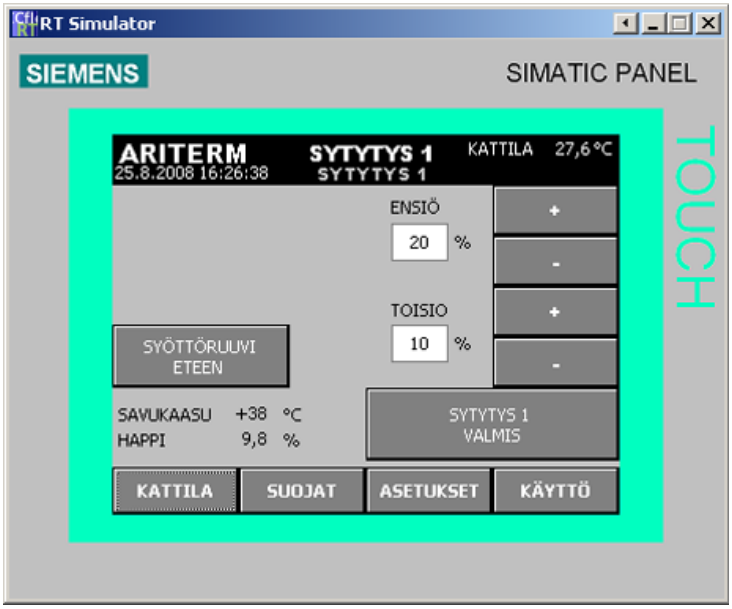
In the example in the picture, about 20 litres of fuel are fed onto the grate.

4. Now the fuel on the grate can be lit up. The flue gas aspirator and the primary blower 1 can be started to enhance the burning process. Apply the following settings. It pays, however, to adjust the settings depending on the fuel.

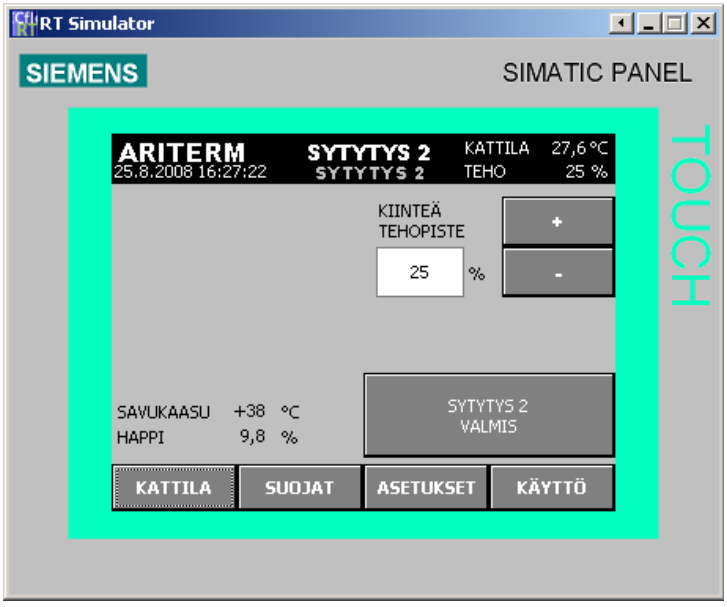
- set "SK ASPIRATOR" to 20 %.
- set "PRIMARY BLOWER" to 10 %.

As soon as the fuel has caught fire properly, go to point five.

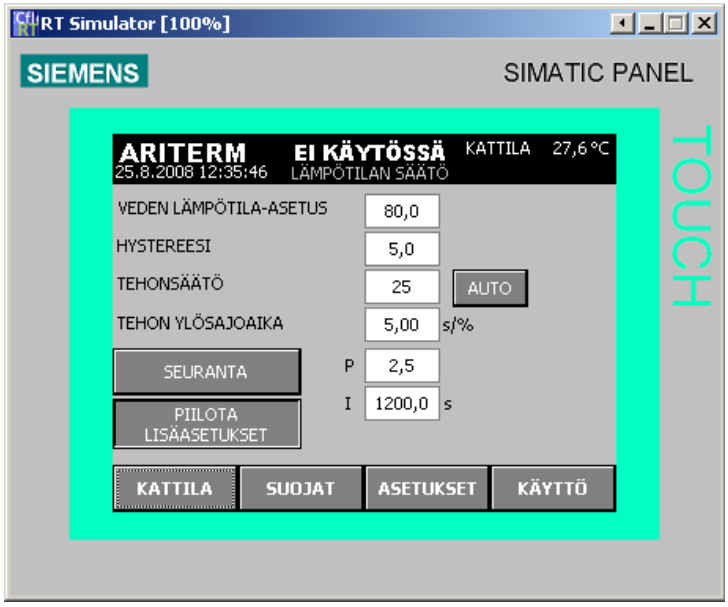
5. If "AUTOMATIC" operation is selected, while there is no flame in the heater, the operator will be directed to the guided light-up procedure "LIGHTING UP 1". A screen will then be displayed, giving the options to drive the feeding screw manually and switch on the primary and the secondary blower (the speed of the blowers is set using the +/- keys). As soon as the fuel has been lit, and the flame has "grown" sufficiently, the "LIGHTING UP 1 COMPLETED" key shall be depressed to go to the next stage "LIGHTING UP 2".




6. The burner will be driven on fixed output (the setting "FIXED OUTPUT POINT"), which the operator can increase according to his own discretion. The feeding of the fuel and the blower functions will be controlled automatically. After the flame has been sensed in the burner, the flame symbol will appear at the left upper corner of the screen. Then the "LIGHTING UP 2 COMPLETED" key shall be depressed to go over to the automatic adjustment of output. The operator does not have to wait until the flame symbol is displayed, but he can accept the "LIGHTING UP 2" stage being completed even earlier.



7. After this, go to the point "TEMPERATURE ADJUSTMENT", where you can adjust the temperature settings of the burner.




Enter the desired drying temperature in the field "WATER TEMPERATURE SETTING".

The setting "HYSTERESIS" determines the temperature difference at which the burner is switched over to the maintenance burning (output 20 %).
If the "WATER TEMPERATURE SETTING" is 80 °C, and the "HYSTERESIS" is 5 °C, this means that switching over to the maintenance mode will take place at the temperature of 85 °C. As soon as the temperature has sunk to the value equivalent to 0.5*"HYSTERESIS", in the example to 2.5 °C, the high-power operation will resume at the stage 21 %.

During normal use, the burner is operated in such a manner, that the output will be automatically adapted to the heat requirement. The output will then be adjusted in 1 % steps from 20 % to 100 %. It is also possible to operate the burner at a fixed output. The desired output % is determined in the "OUTPUT SETTING" field, and the "AUTO/MAN" key is set to "MAN" position. In this mode the burner is driven at fixed output, which means that the high-power and the maintenance periods are sequenced.

"RAMP-UP TIME OF THE OUTPUT" When the regulator strives to increase the output, this setting restricts the speed of change. The setting determines how many seconds "must pass" at least until the regulator increases the output by 1 %.

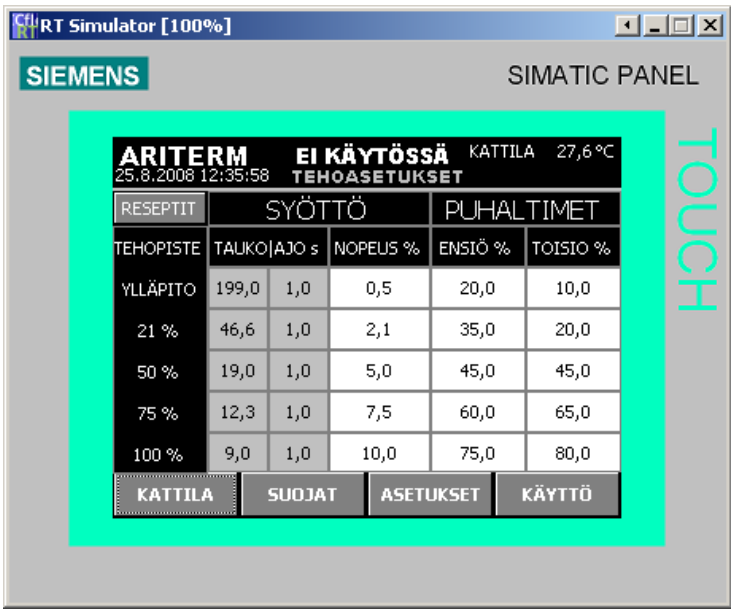
The parameters P and I affect the speed and accuracy of the adjustment. These parameters can be hidden pressing the key "HIDE THE ADVANCED SETTINGS".

By depressing the "FOLLOW-UP" key, you can access the screen with which you will be able to monitor the output and the change of temperature in the boiler over a period of one hour or 24 hours. This trend tool is useful especially at start-up, if it proves necessary to fine-tune the parameters for the output.

**NOTE! When monitoring the drying temperature, pay attention only to the "BOILER 27.6 °C" temperature at the upper right corner of the screen, because the dryer's proprietary drying temperature display is not connected to the control system of the bioheater.**

## Adjusting the burner

You can adjust the feeding speed of the burner (SPEED%), the primary blowers (PRIMARY1 % ja PRIMARY2 %) as well as the secondary blower (SECONDARY %) in the ”OUTPUT SETTINGS” screen.




**Adjustment hints:**
If unburned substance starts to accumulate on the grate and/or among the ash, the feeding rate of the burner screw must be reduced and/or the output of the blowers increased.
If the tip of the flame is black, and the heater gets dirty quickly, the output of the secondary blower must be increased and/or the feeding rate of fuel decreased
If the flame is blueish and uneven, the output of the secondary blower must be decreased.
If there are lightweight particles in the fuel, some of them will be ejected from the burner by the airflow before they burn completely. This may be established by sparking occurring in the furnace of the heater or by the increased generation of ash. The number of particles being ejected can be decreased by reducing the airflow (blowers).

Indicative rates for feeding, blowing and grate movements for dry industrial chips and moist mixed chips are given in the table below. An experienced user can adjust the burner visually. The flame should be light yellow, and the burning should be smooth. More precise adjustment requires, however, that a flue gas analyser be used. Use of a flue gas analyser is recommended.

Feeding and blowing rates have also been listed for burning oat. This, however, requires gaining great familiarity with the subject as burning oat differs totally from burning chips. Burning grain creates considerably more ash, and greater attention must be paid in particular to the movements of the grate so as to prevent the grain from getting sintered.

**Quality of chips: Dry industrial chips**

| Out-put | Pulse | Pause | Feeding % | Primary blower 1 | Primary blower 2 | Secondary blower 1 | Secondary blower 2 | Grate Pause s | Grate Running s | Counter short movement |
|---|---|---|---|---|---|---|---|---|---|---|
| **PP** | | | 2.5 | 15 | 5 | 10 | | 100 | 1 | 2 |
| 21 % | | | 30 | 35 | 10 | 20 | | 6 | 4 | |
| 50% | | | 40 | 50 | 15 | 25 | | 5.8 | 4 | **Running time from centre limit** |
| 75 % | | | 50 | 60 | 20 | 35 | | 3.7 | 4 | |
| 100 % | | | 60 | 75 | 25 | 40 | | 3.2 | 4 | 8 |

**Quality of chips: Moist mixed chips**

| Out-put | Pulse | Pause | Feeding % | Primary blower 1 | Primary blower 2 | Second-ary blower 1 | Secondary blower 2 | Grate Pause s | Grate Run-ning s | Counter short move-ment |
|---|---|---|---|---|---|---|---|---|---|---|
| **PP** | | | 2.5 | 15 | 5 | 10 | | 100 | 1 | 2 |
| 21 % | | | 30 | 35 | 10 | 20 | | 6 | 4 | |
| 50% | | | 38 | 50 | 20 | 25 | | 5.8 | 4 | **Running time** |
| 75% | | | 45 | 65 | 35 | 35 | | 3.7 | 4 | **from centre limit** |
| 100% | | | 68 | 70 | 45 | 40 | | 3.2 | 4 | 8 |

**Cereal: Oat**

| Out-put | Pulse | Pause | Feeding % | Primary blower 1 | Primary blower 2 | Second-ary blower 1 | Secondary blower 2 | Grate Pause s | Grate Run-ning s | Counter short move-ment |
|---|---|---|---|---|---|---|---|---|---|---|
| **PP** | | | 1.5 | 15 | 10 | 5 | | 100 | 1 | 15 |
| 21 % | | | 4 | 40 | 20 | 10 | | 15 | 1.5 | |
| 50% | | | 5.5 | 50 | 20 | 15 | | 12 | 1.5 | **Running time** |
| 75% | | | 7.5 | 60 | 25 | 20 | | 10 | 1.5 | **from centre limit** |
| 100% | | | 9 | 70 | 30 | 30 | | 9 | 1.5 | 8 |

With current combustion technology even moist fuel can be burned, but along with the increase of moisture content there will also be a dramatic increase in the fuel consumption, as well as in the need for servicing. Combustion of moist fuel is incomplete, and the amount of soot and ash created will be greater. As the moisture content of the chips increase by 10 percentage units, the efficiency of the heater decreases by 5 percentage units.
The higher the moisture content of the fuel, the lower the efficiency. The fuel consumption increases.
The lower the moisture content of the fuel, the higher the efficiency. Low fuel consumption.

**NOTE! The readjustments will not take effect until after a few minutes.**

**NOTE! If the contents of the fuel changes, a new setting shall be applied.**

*Target values for combustion*

| Target values for combustion | |
|---|---|
| Oxygen ($O_2$) | 7-9 % |
| Carbon mon-oxide (CO) | 100-400 p.p.m., chips |
| Carbon mon-oxide (CO) | 50-500 p.p.m., pellets |

*Consumption of chips at different outputs*

| Output | Consumption in hours h/m³ | | | |
|---|---|---|---|---|
| kW | 1 h | 2 h | 3 h | 4 h |
| 500 | 0.6 | 1.2 | 5.9 | 11.8 |
| 400 | 0.45 | 0.9 | 4.7 | 9.4 |
| 300 | 0.35 | 0.7 | 3.5 | 7.1 |

## Maintenance of the burner and shutting off

If you desire to shut off the burner, and bring the burner into the maintenance mode, select "BOILER" to open the screen below. Select the desired operation on the screen: "MAINTENANCE OF THE DRYER" or "SHUTTING DOWN THE DRYER".

Use the "SHUTTING DOWN THE DRYER" function, if you wish to shut down the bioheater.

If you select "SHUTTING DOWN THE DRYER", the storage system stops, i.e. the free fall funnel will not be filled any more. The system will continue its operation until the fuel in the feedig screw and funnel runs out. The burning can be finally switched off by depressing "STOP" as soon as the combustible material on the grate is finished.

The function "MAINTENANCE OF THE DRYER" is used, if running in the "HIGH-POWER" mode will be required shortly. For example, for batch change in dryer use. The burner will then operate with maintenance settings. As an example, the feeding and blowing rates for dry industrial chips are presented below. The burner feeds a small amount of fuel to maintain only a small flame on the grate. To switch back from the maintenance mode to the high-power operation, select ”OPERATION” and ”AUTOMATIC”.
Then the burner will assume the parameter entered in the ”ADJUSTMENT OF TEMPERATURE”, ”ADJUSTMENT OF WATER TEMPERATURE” field.

**Quality of chips: Dry industrial chips**

| Out-put | Pulse | Pause | Feeding % | Primary blower 1 | Primary blower 2 | Secondary blower 1 | Secondary blower 2 |
|---|---|---|---|---|---|---|---|
| **PP** | | | 2.5 | 15 | 5 | 10 | |

**NOTE! In the maintenance mode, the "OUTPUT SETTINGS" require changing at the beginning and follow-up according to user. This is to avoid potential back burn risk.**

## Malfunctions, causes and remedies

| Malfunction | Cause | Remedy |
|---|---|---|
| The safety equipment has stopped the system | The motor protection switch has tripped as a result of too high resistance | Remove the item preventing the screw from moving by turning the screw to the rear, and check that the screw can rotate freely. Reset the alarm. |
| | The motor protection switch has tripped because of a missing phase | Check the electricity supply. Reset the alarm. |
| | The overheat protection of the boiler or the burner head has tripped as a result of overheating. | Find out the reason for overheating. Remove the cause of the malfunction. Reset the overheat protection. Reset the alarm. |
| | The flame control thermostat has tripped, because the flue gas temperature has sunk under the set value. | Check the fuel supply: Restart the system. As required, lower the setting of the flame control thermostat. |
| | The back burn thermostat has tripped, because the surface temperature of the screw pipe has risen over its set value. | Find out the cause of back burn. Restart the system, if it is safe.<br>As required, change the settings (the ambient temperature can trigger an alarm). |
| | The AVTA valve has tripped as a result of overheating of the screw pipe, and filled the intermediate tank with water. | Drain off water through the drain hole in the bottom of the water tank. Feed the moist fuel via the burner head into the ash space. Feed dry fuel to the burner head and start the system. |
| | The dislocation limit has tripped, because the boiler or the burner screw has been shifted out of position. | Remove the excess fuel from the boiler and the burner. Check the connections of the pipes, the other connections and the function of the flame control system. |
| | The limit switches on the doors have tripped, because some of the doors are open. | Find out the cause. Shorten the operating period of the bar dischargers. Check the operation of the photo cell in the intermediate tank. |
| | The flue gas aspirator has stopped. | Find out the cause – either the electricity supply or frequency transformer. |

| Malfunction | Cause | Remedy |
|---|---|---|
| The AVTA valve lets water leak through | Impurities in the valve | Remove and clean |
| The valve of the pulse-controlled back burn protection lets water leak through | Impurities in the valve, and the direction of flow in the valve is wrong. | Remove and clean, check the flow direction. |
| The heating capacity falls short. | The output of the storage screw is not sufficient, smoke get into the intermediate tank and disturbs the photo cell. | Ensure that the vacuum in the boiler is sufficient. |
| | The dust-generating fuel disturbs the photo cell in the intermediate tank. | The interval between the filling times of the funnel must be shortened to 8-12 seconds. |
| The system has stopped. Alarm. | | Check the cause of the alarm. Find out the reason for the alarm |

## Service during the operation

- If all annual services have been performed with care, the dryer heater only requires daily visual checking during the operating season. Even when the operation of the heater is controlled from the electric centre of the dryer/burner, it is advisable to go and look at and listen to the heater a few times a day to ensure its normal operation.

- It is advisable to look at the upper end of the flue pipe always when passing by: the exhaust gases should be colourless and invisible. Visible water vapour may come out with the flue gases when a cold heater is started. Dark, visible smoke indicates incomplete burning of the fuel. Then the flowrate of burning air must be checked immediately to prevent the heat exchanger from getting sooted.

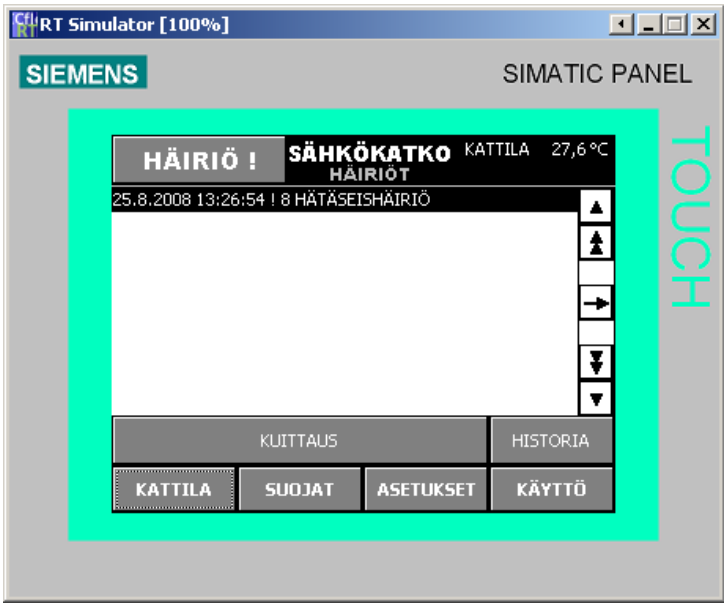
- The net in front of the suction opening must be clean. Observe the fire risk. If you have to clean the net regularly, you have to do something about the surroundings, otherwise the risk of fire will be too high.

- Remove the ash from the ash space in the furnace at least once a week or more often, if necessary. It is good to check also the ash box once a week, and empty it, as required.

## Resetting the malfunctions and the GSM modem

In the event of an alarm, the key "MALFUNCTION !" will appear on the left-hand side in the upper edge of the screen. You can move to the "PROTECTIONS" screen by pressing this key. Check and remove the possible cause of the malfunction in the system, and after that, reset the alarm using the "RESET" key. After this the system will continue its operation. The cause of the alarm in the example in the picture, has been a power failure, which is shown also in the operating status field of the burner.

**NOTE! If you cannot reset the malfunction, for example, in case of malfunction in the storage screw motor, check whether the motor protection in question is switched off.**




### GSM modem

The GSM modem is an important accessory. We recommend that you obtain it from the burner supplier. In case of malfunction, the GSM modem informs about the cause by sending an SMS message to the pre-selected telephone number. In connection with the purchase and installation of the GSM modem, you shall make a subscription for the modem with a telephone operator. If you wish to use this subscription/SIM card with a normal mobile phone outside its special use during harvesting/drying season, it pays to subscribe the operator's cheapest basic subscription.